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OCCUPATIONA PENSIONS, WAGES AND TENURE WAGE PROFILES*

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Abstract

Using data from the BHPS, we estimate the impact of occupational pensions on wages and on the tenure profile of wages of male private sector workers in the UK. According to the theoretical literature, occupational pensions participants should receive a premium at the beginning of their careers, when the financial quit disincentives stemming from defined benefit plans are less binding. Our empirical evidence is consistent with this prediction. We find that occupational pension participants earn a positive wage premium only at the beginning of the career. Once we account for the endogenous sorting of individuals into occupational pension schemes, the magnitude of the estimated premium decreases sharply and it looses statistical significance. Indeed, the wage premium appears to be completely explained by unobservable individual and job match heterogeneity.

JEL classification: C23, C29, J24, J31

Key words*:* employer tenure, instrumental variables, occupational pensions, panel data, wage profiles

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1 Introduction

A number of issues are still unresolved in the literature on wage determination. At the empirical level, much of the debate has focused on the issue of whether wages rise with years of seniority and on the possible explanations for this effect. The relationship between occupational pension participation and wages has received only limited attention. Furthermore, although occupational pensions play an important role in the implicit contract literature, to the best of our knowledge no empirical studies have focused on the relationship between occupational pensions and tenure wage profiles. This paper attempts to fill this gap in the literature, its main aim being to investigate the empirical validity of alternative theoretical explanations of the pension-wage nexus.

A common indirect finding stemming from the literature studying the relationship between occupational pensions and job mobility is that workers in occupational pension plans receive higher wages. Gustman and Steinmeier (1993) argue that firms offering pensions also pay wages set above competitive levels ("efficiency wages") to give workers an incentive to stay in order to collect the stream of wage premiums. In this framework, a pension premium accruing to occupational pension workers would be mainly driven by unobservable factors specific to the worker-firm pair (unobservable job match heterogeneity). Alternatively, the implicit contract theory itself predicts higher wages in firms offering pensions of the defined benefit type not because of efficiency wages but because firms must pay a compensating wage premium to workers who accept deferred wage contracts (Ippolito, 1994). The premium is required because workers in long term con-

tracts forgo some opportunities for higher-paying jobs in their career. Finally, Ippolito (1997) suggests that any compensation scheme that emphasizes occupational pensions can select in high quality workers ("sorting effect"). In this model, rather then efficiency wages or deferred wage premiums, pension wage premia would reflect a superior job performance of occupational pension participants, due to unobservable differences in earnings capacities among individuals (unobservable individual heterogeneity).

This paper investigates the empirical validity of these alternative explanations of the pension-wage nexus. We focus on the United Kingdom, where occupational pension plans represent the more popular retirement saving vehicle among those available to workers to supplement the basic State pension. Exploiting the longitudinal nature of the British Household Panel Survey, we account for the role of different sources of unobserved heterogeneity in shaping the effect of occupational pension participation on wages and on the tenure profile of wages. More specifically, we structure the empirical analysis around three main questions. Do workers participating into occupational pension plans receive a compensation premium? If this is the case, does this premium vary over tenure? And what is the main source of this premium?

Our empirical strategy is as follows. After estimating with least squares a standard wage equation augmented with occupational pension variables, we use instrumental variables estimators and panel data estimators to control for the possible correlation between regressors and unobservable factors. A comparison among these different estimators will suggest the most probable source of bias affecting least squares results. In addition, allowing the returns to occupational pensions to depend on tenure enables

us to compare tenure wage profiles between participants and non participants and to appreciate the variation of the wage premium over their career.

The results show that the estimated occupational pension premiums are large and significant using least squares in a cross section of workers. In particular, we find that the wage premium is high and significant early in tenure, when the financial quit disincentives implicit in occupational pension plans of the defined benefit type - dominant in the UK - is less binding, while it decreases later in the worker career. When we use panel data and instrumental variable estimators to control for the endogenous sorting of individuals into occupational pension schemes, the magnitude of the premium decreases sharply, and it looses statistical significance. Overall, our findings are consistent with the literature predicting that occupational pensions and wage profiles are used in combination to retain better workers (Ippolito, 1997) as well as with the strand arguing that they reflect efficiency wages premia (Gustman and Steinmeier, 1993), particularly for younger workers (Akerlof and Katz, 1989). Indeed, we find that both unobservable individual characteristics and unobservable factors specific to a worker-firm pair play an important role in determining wage premia.

The paper is organized as follows. The next section briefly reviews the theoretical mechanisms proposed in the literature to explain the relationship between occupational pensions and wages. Section 3 briefly describe the UK pension system. Section 4 describes the data. Section 5 presents our empirical approach and discusses the results. Section 6 concludes.

2 Theoretical Framework

On the conceptual level, we know that wages and occupational pensions are jointly determined. Occupational pension plans can be of two types: defined benefit (DB) plans and defined contribution (DC) plans. A DB plan defers a significant portion of compensation until the worker successfully completes long tenure. Alternatively, a DC plan is a retirement saving account where the firm might contribute some percentage of workers' wages. To investigate the relationship between occupational pension (either of the DB or the DC type), wages and tenure wage profiles, it may be useful to recall at least three competing hypotheses that have been used in the literature to explain the relationship between employer sponsored retirement savings plans and employee quitting behaviour.

Under the implicit contract theory, a DB plan is seen as an implicit contract under which workers sacrifice potential higher wages elsewhere in exchange for a "stay" pension but are awarded a lower "quit" pension if they depart prematurely, thereby imposing a pension loss on quitting.[1] The pension capital loss has a concave shape respect to employer tenure, being negligible at the beginning of the worker career. In addition, the pension capital loss may trigger a selection effect. A DB plan attracts "stayers" while repelling "quitters".[2] The implicit contract theory applies to DB plans, but not to DC plans where workers can quit any time after vesting[3] without incurring capital losses. The implicit contract theory predicts that firms using DB pensions pay compensating wage premiums to workers who accept a deferred-wage contract. The

premium is required because workers in long-term contracts forgo some opportunities for higher-paying jobs later in their career (Ippolito 1994).

However, Gustman and Steinmeier (1993) find that quit rates are lower in all pension jobs, either of the DB or the DC type. This evidence cannot be easily intepreted within the implicit contract theory framework. They argue that the pension-quit nexus can be explained if firms offering pensions also pay "efficiency wages", which are wages set above competitive levels to give workers an incentive to stay in order to collect the stream of wage premiums. The bonding effect of efficiency wages is higher early in tenure when the present value of premium is highest, and falls as workers collect the premium each period (Akerlof and Katz 1989). Under this framework firms use both occupational pensions, either of the DB or the DC type, and efficiency wages to reduce quit over all tenure levels.

Ippolito (1998, 2002) offers an alternative idea that can be used to justify the payment of pension wage premia. If the attribute[4] that makes some workers "savers" also makes them "high-quality" workers, any compensation package emphasizing occupational pensions will naturally attract savers. Assuming that firms will try to retain their best workers (by paying them more, among other things), it follows that high-quality workers will more often attain long tenure. This creates a potentially important nexus: occupational pensions attract savers, who also are high-quality workers. In this model, high wages in pension jobs do not necessarily reflect either efficiency wages or compensation for sacrificing mobility in the job market, but rather, may simply reflect the superior job performance of savers in the workforce. In this framework, both DB

and DC plans can enhance productivity by attracting a high quality workforce.

Alternatively, the relationship between occupational pension participation and wages as such has received only limited attention. In particular, although occupational pensions play an important role in the implicit contract literature, no empirical studies have focused on the relationship between occupational pensions and tenure wage profiles. The literature includes competing views of how wages are determined, even where there is long-term job attachment. Some argue that wage experience and wage-tenure profiles are more likely to reflect efforts by the firm to economize on the costs of specific training or on the costs of generating a good match. Others argue that the profiles reflect selection in mobility over the course of the life cycle, so that those with higher productivity are more likely to stay with the job, or even pure returns to seniority. While these issues are still unresolved, and notwithstanding the clear predictions stemming from the theoretical literature[5], the impact of occupational pension participation on wages and on tenure wage profiles has not been extensively studied at the empirical level. The available studies limit their attention to analyze the relationship between occupational pension participation and wages over the cross sectional dimension, often finding a positive correlation.[6] However, working with cross sectional data does not allow to account for the influence of unobservable factors. Alternatively, our empirical strategy attempts to assess the existence, the magnitude and the tenure profile of the occupational pension wage premium, accounting for endogeneity issues.

3 Pension Arrangements in the UK

We focus our analysis on the United Kingdom, where occupational pensions play a major role among the different pension arrangements workers are allowed to choose in order to supplement the basic State pension. The current UK pension system has a three tiered structure. The first tier is public, and consists of a basic flat-rate pension. The second tier is mandatory and pension provision is split between the State - in the form of the State Earnings-Related Pension Scheme (SERPS) - and private companies - in the form of occupational pension schemes, offered by employers, and personal pension schemes, offered by financial institutions. Workers belong by default to SERPS, but they are free to contract out an approved occupational pension, in case their employer offers one, or an approved personal pension plan. Since 2001 the contracting out option has been extended to the "stakeholder pensions", provided in the form of DC accounts by an insurer through the employee's workplace. Employers are not mandated to sponsor an occupational pension plan, while employees can always decide to remain into SERPS or to contract out a personal pension plan even if they have been offered an occupational one. Furthermore, workers' pension choices are mutually exclusive and reversible. Finally, there is a third tier of voluntary private retirement saving. Given the low benefits provided by the public pension system, occupational pensions have an important role in the UK, covering large portions of the workforce. Table 1 reports figures from the *Occupational Pensions Schemes Survey* collected over the 90s by the Government Actuary.[7] To a downward trend in private sector occupational pension

schemes' membership corresponds a relatively stable distribution of active members by occupational plan type. In particular, more than 80 percent of plan participants still belonged to DB plans by the end of the decade.

4 Data

Our empirical analysis is based on a sample drawn from waves 1 to 11 of the British Household Panel Survey (BHPS) data, covering the period 1991-2001.[8] The analysis is restricted to full-time white males aged between 20 and 55, working as full time employees (more than 30 hours per week) in the private non-agricultural sector. Individuals with missing or imputed data on the dependent or the independent variables are excluded from the sample. In addition, only the respondents who are Original Sample Members (OSM) and have reported in at least two waves that they were employed at the time of the interview are considered. Based on these criteria an unbalanced panel sample of 1.348 male employees and 9.103 observations in total is constructed.

The BHPS collects detailed information on individuals' job related and socio-economic characteristics. In particular, employees are asked if their current employer runs a pension scheme for which they are eligible and if they participate to it. Workers participating to occupational pension plans are not further asked about the DB/DC nature of their plan, while they are also asked if they contribute to a personal pension scheme. Table 2 indicates that more than three quarters of our sample is covered by an occupational pension plan, while participation rate is about 60 percent.

Table 3 contains pension status transitions for all individuals averaged over years.

Although workers are free to choose their pension status each year, we can observe a substantial inertia in pension status.

Finally, Table 4 displays descriptive statistics on our sample, divided by pension scheme participation. It seems that workers participating to an occupational pension plan (column two) are quite different in terms of observed characteristics from those not participating. They have higher wages, longer employer tenure and labour market experience, are more likely to be married, to receive job related training, to be union member, while they are less likely to be in a temporary contract. The magnitude of these differences rises the suspect that pension and nonpension workers and/or jobs could further differ in terms of unobservables. Our empirical strategy allows to control for and assess the importance of different sources of heterogeneity.

5 Empirical Analysis

5.1 Statistical model

Our empirical investigation on the relationship between wages and occupational pensions is based on a standard wage equation described in Altonji and Shakotko (1987) and Topel (1991), augmented with occupational pensions variables:[9]

$$\begin{aligned} w_{ijt} &= \beta_1 T_{ijt} + \beta_2 T_{ijt}^2 + \beta_3 Exp_{it} + \beta_4 Exp_{it}^2 \\ &\quad + \beta_5 OP_{ijt} + \beta_6 OPJ_{ijt} + \beta_7 OPJ * T_{ijt} + \beta_8 OPJ * T_{ijt}^2 + \sum_{k=1}^{K} \gamma_k x_{it}^k + \varepsilon_{ijt}, \\ \varepsilon_{ijt} &= \eta_i + \phi_{ij} + v_{ijt}, \end{aligned} \tag{1}$$

where w_{ijt} denotes the (log) gross hourly wage for individual i on job j at time t, Exp_{it} is total potential labour market experience, T_{ijt} is current employer tenure, OP_{ijt} is a

dummy indicating the availability of an occupational pension scheme from the current employer, OPJ_{ijt} indicates individual participation to such a scheme, x_{it}^k (for $k = 1, ..., K$) is a set of K control variables for individual i on job j at time t that includes a constant term, time dummies, regional dummies, occupation and qualification dummies, establishment size dummies, two dummies for union coverage in the workplace and for union membership, one for temporary job, one for job related training as well as a dummy for joining a personal pension scheme and a marital status dummy. The error term consists of three independent components. The first one, η_i, is an individual-specific effect, capturing variations in wages that may be due to unobservable earnings capacity across individuals (i.e. unobserved individual heterogeneity); the second, ϕ_{ij}, is a job match-specific effect, representing unmeasured effects on wages that may be specific to a worker-firm pair (i.e. unobserved job match heterogeneity); the third one, v_{ijt}, is a white noise component, accounting for marketwide random shocks. Precise definitions of the main variables used in model (1) can be found in Appendix 1.

This model specification enables us to appreciate the impact of occupational pensions on wages not also at the beginning of a new job but also in shaping the effects of tenure on wages, that is to compare the tenure profile of wages of workers in and out occupational pensions schemes.

5.2 Estimation methodology

Any covariance between the regressors and the unobservable factors represented in ε_{ijt} would lead to biased least squares estimation results. Possible different signs and

structures of the covariances between seniority, experience and individual and job match specific effects have been extensively discussed in the literature on job mobility and wage growth.[10] In this paper, we introduce and examine the effects of a possible further source of wage growth, that is the individual's participation to an occupational pension scheme. Also in this case, endogeneity and heterogeneity issues need to be taken into consideration. Indeed, comparing the wages of workers with and without occupational pensions would likely provide biased results for the returns to tenure, due to the non random assignment of workers to occupational pension schemes.[11] As an attempt to recover the true effect of occupational pensions on wages and to compare the relative importance of the individual and job heterogeneity bias, we use panel data and IV estimators. Our estimation strategy is as follows.

We first show the OLS estimation results (OLS). However, it is well known that least squares estimators are likely to be biased in presence of endogeneity issues.[12] We start correcting at least for some of the possible estimation bias by using a panel data fixed effects estimator (WG). If the endogeneity bias exists only due to unobserved individual heterogeneity, that is only due to correlation between the unobserved time invariant individual characteristics and the observables, a panel data fixed effects estimator would be appropriate. A substantial difference with least squares results would indicate the importance of individual unobserved heterogeneity and suggest the sign of the bias in the least squares estimators on the variables in levels. However, the WG, a least squares estimator on transformed variables, may be downward biased due to the presence of measurement errors (Griliches and Hausman, 1984) and it does not account for the

presence of other sources of endogeneity different from correlation between regressors and unobserved individual fixed effects. Thus, in order to alleviate further endogeneity issues stemming from a possible correlation with also the job match specific component of the error term and to account for the possible presence of measurement errors, we use instrumental variables procedures using the variables in levels. We exploit the longitudinal structure of the data and instrument the tenure variables following the procedure proposed by Altonji and Shakotko (1987), hereafter AS, and the experience variables using the Finnie's (1993) modification of the AS estimator.[13] Moreover, we instrument our variable of interest, the occupational pension participation variable, using the occupational pension offer rate by industry, firm size and union coverage. The validity of the pension offer rate as an instrument for individual pension participation is grounded on the fact that the percentage of employees joining an occupational pension scheme within an industry, firm size and unionized sector is related to the individual decision of an employee in the relative industry, firm size and union sector to join the scheme but it is not related to any of the error components in the individual's wage determination model (model (1)). Instrument variation is reported in Table 5. We denote the estimator described above *IVop*. We expect this estimator to be free from most of the biases. Because the *WG* produces an estimate of the returns to occupational pensions free from the bias due to correlation between the occupational pension variables and individual fixed effects and *IVop* produces an estimate of the returns to occupational pensions free from the bias due to correlation between the occupational pension variables and both individual and job match effects, a substantial difference

between *WG* e *IVop* can be interpreted as a signal of the importance of unobservable job match heterogeneity. Thus, a comparison between *OLS*, *WG* e *IVop* could give an indication of the relative importance of individual and job match heterogeneity in the returns to occupational pensions.

5.3 Results

Table 6 contains the estimation results on the central variables.[14] The complete list of estimation results for all the control variables included in model (1) is reported in Table 8.[15] Looking at Table 6 (columns two and three), the first observation to make is that the fact that the current employer offers a pension scheme is not significant in the mechanism underlying wage determination, whereas the employee's decision to join such a scheme seems to play an important role. Indeed, looking at the OLS results (column two), the OP coefficient is positive but not significant whereas the OPJ is large and significant. Because the availability of an occupational pension scheme can be considered as an (observable) match fixed-effect (see Table 3), this evidence seems to point to the fact that job-specific characteristics do not play an important role in the wage determination mechanism. Column three of Table 6 shows that the OLS results obtained by removing OP from model 1 (*OLS2*) are virtually unchanged, thus this variable is excluded from the set of explanatory variables to avoid further endogeneity issues.[16]

Let us first analyse the estimated coefficient of OPJ obtained using the estimation methods described above: *OLS2, WG* e *IVop* (columns three, four and five in Table 6

respectively). This variable is meant to capture the effects of occupational pensions on wages that are independent of tenure and other individual characteristics. Looking at column three (*OLS2*) we find a large and significant wage premium accruing to occupational pensions schemes participants. Specifically, the participation to an occupational pension scheme would raise the wage of 0.23 percentage points. Column four contains the *WG* results. We find that, using such an estimator, the effect of occupational pensions participation on wages reduces substantially (from 0.23 to 0.06), although it remains positive and statistically different from zero. Columns five reports the *IVop* results. The estimated coefficient of OPJ, not only decreases further (estimated impact reduces from to 0.007) but also it looses its statistical significance.[17] These results are consistent with least squares having a positive bias due to both individual and job match unobserved heterogeneity Indeed, these unobservable factors appear to explain completely the OLS estimated wage premium.

Let us now focus our attention on the estimated coefficients of the variables interacting the indicator of occupational pensions participation with tenure. We find a similar pattern across the different estimation methods. Let us comment our findings in details.

The estimated (cumulated) returns over tenure (corresponding to the estimation results in Table 6) are reported in Table 7.[18] According to the OLS estimates (*OLS2,* column two), the returns to occupational pensions are large and significant at the beginning of a worker career. Specifically, one year of tenure is associated with 0.23 percent wage increase. When considering higher levels of tenure, the estimated magnitudes

of the returns are consistent with the prediction of the theoretical literature. Indeed, they appear first decreasing and then increasing, showing a profile roughly symmetric to the pension loss shape. However, the estimated coefficients loose their statistical significance, starting from around five years of tenure. This finding provides evidence supporting in particular the Akerlof and Katz (1989) model. According to this theoretical framework, the pension penalty is insufficient to deter shirking of workers with short tenure and so the pension is coupled with an efficiency wage. Following this intuition, the model explains the wage premium for younger workers and predicts that the wage premium should evaporate as tenure grows and pension incentives become important.

Column three of Table 7 reports the returns to occupational pensions obtained using a panel data fixed effect estimator (*WG)*. The substantial difference with the OLS results signals the importance of individual unobserved heterogeneity. The estimated magnitudes of the coefficients over tenure appear considerably reduced in magnitude for all tenure levels. Looking at the returns at the beginning of a worker career, the estimated impact of occupational pension participation on wages after one year of tenure is still positive and statistically different from zero, but it reduces from 0.23 to 0.06 percentage points. When considering higher levels of tenure, the results remain in line with the predictions of the Akerlof and Katz (1989) model. Indeed, the profile of the estimated magnitudes preserves a shape roughly symmetric to the pension loss, showing statistically non significant values from roughly five year of tenure onwards. In addition, the difference between *OLS* and *WG* results suggests the existence of a positive correlation between occupational pension variables and the individual effects,

that generates a positive and substantial bias in the returns to occupational pensions estimated by OLS. This important effect of individual unobservable characteristics in the estimation of the returns to occupational pensions is consistent with an endogenous sorting of workers into occupational pensions schemes, as implied by the theoretical framework proposed by Ippolito (1997).

Finally, columns four of Table 7 reports the *IVop* results. The *u-shape* of the estimated returns over tenure is preserved, but the estimated coefficients, not only decrease further in magnitude for all tenure levels but they are also no longer statistically significant from zero at the beginning of the worker career. Thus, also job specific unobservable characteristics positively correlated with occupational pension variables appear to be important in shaping the returns to occupational pensions. Indeed, our findings are consistent with least squares estimation results having a positive bias due to both individual and job match heterogeneity. The influence of these unobservable factors completely explains the important wage premia for low levels of tenure estimated using least squares. Thus, our results support not only the argument that more able (productive) workers are more likely to join an occupational pension scheme (Ippolito, 1997) but also the one arguing that workers with better job matches (and thus higher wages) are more likely to have occupational pensions (Gustman and Steninmeier, 1993).

6 Conclusion

We assess the impact of occupational pensions on wages and on the tenure-wage profile of UK workers, accounting for endogeneity issues in the selection mechanism of workers

into occupational pension schemes. Our empirical strategy allows to test alternative theoretical mechanisms proposed in the literature to explain the usual finding of wage premia accruing to occupational pension workers. The results show that the estimated pension wage premium is large and significant using least squares in a cross section of workers. When we use panel data and instrumental variable estimators to control for endogeneity issues, the magnitude of the premium decreases sharply, and it looses statistical significance. Furthermore, allowing the returns to occupational pensions to depend on tenure enables us to compare tenure wage profiles between participants and non participants to occupational pensions schemes and to appreciate the variation of the wage premium over their career. In particular, we find that the wage premium is high and significant early in the career when the financial quit disincentives implicit in occupational pension plans of the DB type are less binding. Consistently with Akerlof and Katz (1989) model predictions, wage premia evaporate as tenure grows and pension incentives become important. The wage premium at all different stages of a worker's career appear to be completely explained by individual and job match specific heterogeneity. Thus, our findings are consistent both with the theoretical literature predicting that occupational pensions and wage profiles are used in combination to retain better workers (Ippolito's "sorting hypothesis") and with the one arguing that that workers with better job matches (and thus higher wages) are more likely to have occupational pensions (Gustman and Steninmeier's "efficiency wage hypothesis").

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Notes

[1]See Andrietti (2003).

[2]Allen, Clark and McDermed (1993).

[3]The vesting period is the minimum period that a worker has to stay in the plan in order to be entitled to her pension rights.

[4]Like a lower discount rate.

[5]Akerlof and Katz (1989).

[6]See Montgomery, Shaw and Benedict (1992) among others.

[7]Government Actuary's Department (1995, 2001, 2003).

[8]The BHPS data can be obtained from the ESRC Data Archive. We acknowledge the original data creators and depositors. They bear no responsibility for the analyses and interpretations presented here.

[9]Estimating model (1) without occupational pensions variables separately for workers joining and not joining occupational pensions schemes we find that the effects of the explanatory variables on wages in not dissimilar between the two groups. That is why we adopt this dummy variables set up.

[10]See Altonji and Shakotko (1987), Topel (1991), Finnie (1993), among others.

[11]For example, it is reasonable to think that workers in better job matches end up joining a pension scheme because they have a higher expectancy to maintain their employment relationship. If better matches are also associated with higher wages least squares estimators of the returns to occupational pensions are expected to be upward biased, due to unobserved job match heterogeneity. Also, unobserved individual heterogeneity may bias the results upward. Firms probably offer occupation pensions to attract and retain more productive (able) workers. As a result, more productive (able) workers will more probably end up joining a pension scheme. If better workers also receive higher wages, then unobserved individual heterogeneity will induce an additional upward bias in the least squares estimates of the returns to occupational pensions.

[12]In particular, they may overestimate the returns to occupational pensions in presence of positive correlation between the decision to participate on a pension scheme and unobservable factors affecting positively wages that are not caused by the participation to an occupational pension scheme.

[13]This method consists on instrumenting the tenure variables with their deviations from job-match means, instruments that result, by construction, orthogonal to the error terms in model (1) . In the same fashion experience variables are instrumented with their deviations

from individual means, that are, by construction, orthogonal to the individual fixed effects. Investigating a possible further source of bias in the returns to tenure and experience stemming from a correlation between the experience instruments and the job match component is beyond the purpose of this paper. (see Dustmann and Pereira, 2003, for a recent discussion on these issues, and an application in the UK context).

[14]Standard errors are in parenthesis. Coefficients marked with one (two) [three] asterisks are significant at 10 (5) [1] percent level.

[15]Time, industry, occupation, employer size, marital status and regional dummies included and not reported. Standard errors are in parenthesis. Coefficients marked with one (two) [three] asterisks are significant at 10 (5) [1] percent level.

[16]The inclusion of OP, that may control for assortative matching, does not alter qualitatively any set of estimation results.

[17]Durbin-Wu-Hausman tests comparing OLS and WG (columns three and four, Table 6) and WG and IVop (columns four and five, Table 6) for the occupational pension participation coefficient, rejects the hypothesis of their equality in all cases. Note that, according to model specification (1), we interpret as job match specific effects any unobservable factor different from unobserved time-invariant individual heterogeneity.

[18]The estimated returns to k years of tenure are:

$$\frac{\partial w_{ijt}}{\partial OP_{ijt}} = \widehat{\beta}_6 + \widehat{\beta}_7 * T_{ijt} + \widehat{\beta}_8 * T_{ijt}^2,$$

where $T_{ijt} = k = \{1, 5, 10, 15, 20, 25, 30, 35\}$.

Standard errors (in parentheses) are the square roots of

$$\begin{aligned} &var(\widehat{\beta}_6) + T_{ijt}^2 * var(\widehat{\beta}_7) + var(\widehat{\beta}_8) * T_{ijt}^4 \\ &+2cov(\widehat{\beta}_6, \widehat{\beta}_7) * T_{ijt} + 2cov(\widehat{\beta}_6, \widehat{\beta}_8) * T_{ijt}^2 \\ &+2cov(\widehat{\beta}_7, \widehat{\beta}_8) * T_{ijt}^3 \end{aligned}$$

Coefficients marked with one (two) [three] asterisks are significant at 10 (5) [1] percent level.

Appendix 1: Description of main variables

wage: real gross hourly wage. Nominal hourly wage is obtained dividing the current gross monthly pay by 4.33 (weekly wage) and then by weekly hours. Weekly hours are the sum of the number of hours normally worked per week and the number of paid overtime hours in normal week. The nominal hourly wage is then deflated with the Retail Price Index.

op (Occupational Pension Offered): dummy variable equal to one if the worker is eligible to join an employer's pension scheme.

opj (Occupational Pension Offered-Joined): dummy variable equal to one if the worker actually joins an available pension scheme.

tenure: number of years spent working with the current employer. In the BHPS, individuals are asked to give the starting date of the job spell, and not the spell with employer. In order to identify the starting date with the present employer, we go back as many spells as there are job changes with the same employer. This involves using retrospective information (job history record, lifetime employer history record, lifetime employment status history record).

experience: number of years since the individual left full time education.

personal pension: dummy variable equal to one if the individual has a personal pension.

union coverage: dummy variable equal to one if the individual is covered by a union.

union membership: dummy variable equal to one if the individual actually belongs to a union.

job training: dummy variable equal to one if the individual receives job related training.

temporary job: dummy variable equal to one if the individual has a temporary job.

married: dummy variable equal to one if the individual is married.

LIST OF TABLES

Table 1: Private Sector Scheme Active Members by Plan Type

Occupationale Pensions:	**1991**	**1995**	**2000**
DB Plans	81.5	80	80.7
DC Plans	18.5	20	19.3

Source: Government Actuary's Department (1995, 2001, 2003)

Table 2: Occupational Pension Schemes Coverage and Participation

Offered OP	**75.6**
Offered OP - joined	60.8
Offered OP - not joined - PP	7.3
Offered OP - not joined - SERPS	7.5
Not Offered OP	**24.4**
Not Offered OP - PP	13
Not Offered OP - SERPS	11.4

Source: Our elaboration on BHPS data.

Table 3: Average Pension Status Transitions over Years-Percentages

Pension Status : **year** t	**Pension Status: year** $t+1$				
	OP j	**OP no j, PP**	**OP no j, SERPS**	**No OP, PP**	**No OP, SERPS**
OP j	71.4	9.2	9.3	1.2	8.9
OP no j, PP	7.5	78.8	1.3	6.6	5.8
OP no j, SERPS	13.7	1	58.3	7.8	19.2
No OP, PP	1.3	11	8.7	66	13
No OP, SERPS	3.2	1.6	1.3	0.5	93.5

Source: Our elaboration on BHPS data.

Table 4: Summary Statistics by Pension Status (Means)

Variable	**OP j**	**OP no j, PP**	**OP no j, SERPS**	**No OP, PP**	**No OP, SERPS**
Log Hourly Wage	2.21	1.894	1.83	1.926	1.76
Tenure	10	6.11	4.06	6.5	4
Experience	23.8	19.6	18.92	21.9	19.35
Union Coverage (%)	54.6	35	43.63	16.55	18.36
Union Membership (%)	41.6	24.8	22.84	12.25	9.7
Job Training (%)	40.7	32.6	29.87	24.3	22
Temporary Job (%)	0.6	1.4	4.4	3.1	9.3
Married (%)	82.91	73.56	69.4	77.36	66.15
Sample Size	5.534	662	683	1.184	1.040

Source: Our elaboration on BHPS data.

Table 5: Pension Offer Rate by Firm Size, Industry and Union Coverage

	Manufacturing		**Distribution**		**Services**	
	Union	**No Union**	**Union**	**No Union**	**Union**	**No Union**
Small Firm	51.2	80	49.1	81.8	49.1	84.7
Medium Firm	80.4	93	77.8	100	73.5	92.1
Large Firm	81.8	98.1	100	100	80	96.4

Source: Our elaboration on BHPS data.

Table 6: Estimation Results - Main Variables

	OLS	**OLS2**	**WG**	**IVop**
OP	0.0107			
	(0.0128)			
OPJ	0.2309***	0.2361***	0.0603***	0.0071
	(0.0174)	(0.0163)	(0.0125)	(0.2058)
OPJ*Tenure	-0.0062*	-0.0060*	-0.0073***	-0.0226**
	(0.0036)	(0.0036)	(0.0028)	(0.0108)
OPJ*Tenure Squared	0.0002	0.0002	0.0003***	0.0007*
	(0.00015)	(0.00015)	(0.0001)	(0.0004)

Table 7: Cumulative Returns to Occupational Pensions

	OLS2	**WG**	**IVop**
1 year tenure	0.2303***	0.0588**	-0.0147
	(0.0543)	(0.0229)	(0.2080)
5 years tenure	0.2106	0.0320	-0.0874
	(0.2692)	(0.4109)	(0.2559)
10 years tenure	0.1947	0.0207	-0.1452
	(0.6372)	(0.6859)	(1.0725)
15 years tenure	0.1884	0.0263	-0.1664
	(1.1930)	(0.8827)	(2.6518)
20 years tenure	0.1916	0.0485	-0.1509
	(1.9693)	(1.1003)	(4.9362)
25 years tenure	0.2044	0.0876	-0.0987
	(2.9757)	(1.4569)	(7.9199)
30 years tenure	0.2267	0.1436	-0.0098
	(4.2153)	(2.0282)	(11.6018)
35 years tenure	0.2587	0.2165	0.1158
	(5.6892)	(2.8327)	(15.9814)

Table 8: Estimation Results - Complete List of Variables

	OLS	**OLS2**	**WG**	**IVop**
OP	0.0107			
	(0.0128)			
OPJ	0.2310 ***	0.2361***	0.0603***	0.0071
	(0.0174)	(0.0163)	(0.0125)	(0.2058)
OPJ*Tenure	-0.0062 *	-0.0060*	-0.0073***	-0.0226**
	(0.0036)	(0.0036)	(0.0028)	(0.0108)
OPJ*Tenure Squared	0.0002	0.0002	0.0003***	0.0007*
	(0.0002)	(0.0001)	(0.0001)	(0.0004)
Tenure	0.0043	0.0043	0.0136 ***	0.0215*
	(0.0030)	(0.0030)	(0.0025)	(0.0117)
Tenure Squared	-0.0001	-0.0001	-0.0004***	-0.0007*
	(0.0001)	(0.0001)	(0.0001)	(0.0004)
Experience	0.0375***	0.0375***	0.0288***	0.0330***
	(0.0021)	(0.0021)	(0.0045)	(0.0040)
Experience Squared	-0.0007***	-0.0007***	-0.0008 ***	-0.0008***
	(0.00005)	(0.00005)	(0.00005)	(0.00009)
Personal Pension	0.0729***	0.0728***	0.0225***	0.0053
	(0.0092)	(0.0092)	(0.0074)	(0.0275)
Union Coverage	-0.0158	-0.0146	0.0321***	0.0377***
	(0.0121)	(0.0120)	(0.0102)	(0.0136)
Union Membership	0.0252 *	0.0248*	0.0507***	0.0673***
	(0.0129)	(0.0129)	(0.0119)	(0.0240)
Job Training	0.0637***	0.0639***	-0.0012	0.0013
	(0.0085)	(0.0085)	(0.0056)	(0.0060)
Temporary Job	-0.0218	-0.0245	-0.0707***	-0.0940*
	(0.0272)	(0.0270)	(0.0179)	(0.0483)
Constant	2.0002***	2.0052***	2.1388***	2.0291***
	(0.0323)	(0.0317)	(0.1250)	(0.1533)